Myron Scholes

(1941-)

Myron Scholes was born on July 1, 1941, in Timmins, Ontario, Canada. He earned a Bachelor's degree in economics from McMaster University in Canada in 1962. At the University of Chicago, he earned an M.B.A. in 1964 and a Ph.D. in 1969.

After completing his dissertation at Chicago he accepted the position of Assistant Professor of Finance at the MIT Sloan School of Management. It was at Sloan that Scholes began testing the capital asset of pricing model. In 1973, Scholes returned to the Graduate School of Business at the University of Chicago. There he continued his research on the effects of taxation on assets prices. Between 1973 and 1980, he became an active researcher in the Center for Research in Security Prices.

In 1981, Scholes accepted a possition at Stanford's in the Business School, Law School in 1983. Together with Mark Wolfson, Scholes developed a new theory for tax planning under uncertainty. Wolfson and Scholes published their findings in *Taxes and Business Strategy: A Planning Approach* (1992).

He is one of the authors of the Black-Scholes equation (derived along with Fisher Black) published in 1973. The Black-Scholes is a model of the varying price over time offinancial instruments (in particular stocks). Today, it is also used in risk management and mortgages.

In 1997, he was awarded the Nobel Prize for Economics, along with Robert Merton, for "a new method to determine the value of derivatives."

The following press release from the Royal Swedish Academy of Sciences describes Scholes' work:

Robert C. Merton and Myron S. Scholes have, in collaboration with the late Fischer Black, developed a pioneering formula for the valuation of stock options. Their methodology has paved the way for economic valuations in many areas. It has also generated new types of financial instruments and facilitated more efficient risk management in society.

In a modern market economy it is essential that firms and households are able to select an appropriate level of risk in their transactions. This takes place on financial markets which redistribute risks towards those agents who are willing and able to assume them. Markets for options and other so-called derivatives are important in the sense that agents who anticipate future revenues or payments can ensure a profit above a certain level or insure themselves against a loss above a certain level. (Due to their design, options allow for hedging against one-sided risk - options give the right, but not the obligation, to buy or sell a certain security in the future at a prespecified price.) A prerequisite for efficient management of risk, however, is that such instruments are correctly valued, or priced. A new method to determine the value of derivatives stands out among the foremost contributions to economic sciences over the last 25 years.

This year's laureates, Robert Merton and Myron Scholes, developed this method in close collaboration with Fischer Black, who died in his mid-fifties in 1995. These three scholars worked on the same problem: option valuation. In 1973, Black and Scholes published what has come to be known as the Black-Scholes formula. Thousands of traders and investors now use this formula every day to value stock options in markets throughout the world. Robert Merton devised another method to derive the formula that turned out to have very wide applicability; he also generalized the formula in many directions.

Black, Merton and Scholes thus laid the foundation for the rapid growth of markets for derivatives in the last ten years. Their method has more general applicability, however, and has created new areas of research - inside as well as outside of financial economics. A similar method may be used to value insurance contracts and guarantees, or the flexibility of physical investment projects.

The problem

Attempts to value derivatives have a long history. As far back as 1900, the French mathematician Louis Bachelier reported one of the earliest attempts in his doctoral dissertation, although the formula he derived was flawed in several ways. Subsequent researchers handled the movements of stock prices and interest rates more successfully. But all of these attempts suffered from the same fundamental shortcoming: risk premia were not dealt with in a correct way.

The value of an option to buy or sell a share depends on the uncertain development of the share price to the date of maturity. It is therefore natural to suppose - as did earlier researchers - that valuation of an option requires taking a stance on which risk premium to use, in the same way as one has to determine which risk premium to use when calculating present values in the evaluation of a future physical investment project with uncertain returns. Assigning a risk premium is difficult, however, in that the correct risk premium depends on the investor's attitude towards risk. Whereas the attitude towards risk can be strictly defined in theory, it is hard or impossible to observe in reality.

The method

Black, Merton and Scholes made a vital contribution by showing that it is in fact not necessary to use any risk premium when valuing an option. This does not mean that the risk premium disappears; instead it is already included in the stock price.

The idea behind their valuation method can be illustrated as follows:

Consider a so-called European call option that gives the right to buy one share in a certain firm at a strike price of $ 50, three months from now. The value of this option obviously depends not only on the strike price, but also on today's stock price: the higher the stock price today, the greater the probability that it will exceed $ 50 in three months, in which case it pays to exercise the option. As a simple example, let us assume that if the stock price goes up by $ 2 today, the option goes up by $ 1. Assume also that an investor owns a number of shares in the firm in question and wants to lower the risk of changes in the stock price. He can actually eliminate that risk completely, by selling (writing) two options for every share that he owns. Since the portfolio thus created is risk-free, the capital he has invested must pay exactly the same return as the risk-free market interest rate on a three-month treasury bill. If this were not the case, arbitrage trading would begin to eliminate the possibility of making a risk-free profit. As the time to maturity approaches, however, and the stock price changes, the relation between the option price and the share price also changes. Therefore, to maintain a risk-free option-stock portfolio, the investor has to make gradual changes in its composition.

One can use this argument, along with some technical assumptions, to write down a partial differential equation. The solution to this equation is precisely the Black-Scholes' formula. Valuation of other derivative securities proceeds along similar lines.

By Ariel Scheib (Jewish Virtual Library)